

Claims

- [c1] 1. A method of making a spray-formed article, the method comprising:
- a) providing a mold that is the inverse of the article, the mold having an exposed surface to be coated by a metallic spray;
 - b) placing the mold on an indexing table that is rotatable in increments between 0 and 360 degrees;
 - c) directing the metallic spray onto a first portion of the mold;
 - d) rotating the mold by a discrete angular increment; and
 - e) directing the metallic spray onto an adjacent portion of the ceramic mold;
 - f) repeating steps d) and e) until a metal-coated mold is formed wherein a substantial portion of the surface of the mold has been coated with the metal spray and the metal-coated mold comprises a metal layer over the mold.
- [c2] 2. The method of claim 1 further comprising:
- g) allowing the metal-coated mold to cool; and
 - h) separating the metal layer and the mold to provide the article.

- [c3] 3. The method of claim 1 wherein the mold and the metal spray are translated linearly along at least one axis relative to each other.
- [c4] 4. The method of claim 1 wherein the mold is translated linearly along at least one linear axis during step e for a discrete time period.
- [c5] 5. The method of claim 4 wherein the mold is:
- 1) translated along a first linear axis for a first time period;
 - 2) translated along a second linear axis for a second time period; and
 - 3) translated along a third linear for a third time period;
- wherein each of the first, second, and third time axes are different.
- [c6] 6. The method of claim 4 wherein the mold is translated linearly along a first linear axis during step e for a first time period and then translated linearly along a second linear axis during step e for a second time period, the second linear axis different than the first linear axis.
- [c7] 7. The method of claim 6 wherein the first linear axis is essentially perpendicular to the second linear axis.
- [c8] 8. The method of claim 7 wherein the mold has a maxi-

mum linear dimension and the discrete angular increment of step d allows the mold to be translated completely along the maximum linear dimension.

- [c9] 9. The method of claim 1 wherein the mold tilted relative to a normal to the ground.
- [c10] 10. The method of claim 1 wherein the mold is rotated a total of at least 180 degrees.
- [c11] 11. The method of claim 1 wherein the mold is rotated a total of at least 360 degrees.
- [c12] 12. The method of claim 1 wherein each rotation of the mold is from 10 to 180 degrees.
- [c13] 13. The method of claim 1 wherein each rotation of the mold is from 30 to 180 degrees.
- [c14] 14. The method of claim 1 wherein each rotation of the mold is about 90 degrees.
- [c15] 15. The method of claim 1 wherein the metal spray is stopped during each rotation of the mold.
- [c16] 16. The method of claim 1 wherein the metal spray is not stopped during each rotation of the mold.
- [c17] 17. The method of claim 16 wherein the step of rotating the mold has an angular velocity that is sufficiently high

that less than about 10% of a coating formed by the metal spray-forms during rotation.

- [c18] 18. The method of claim 1 wherein the metal spray is formed by melting one or more consumable wires with an electric arc to form molten metal and atomizing the molten metal with a high velocity gas jet.
- [c19] 19. The method of claim 18 wherein two consumable wires are melted with the electric arc.
- [c20] 20. An apparatus for making a spray-formed article, the apparatus comprising:
an indexing table for emplacement of a mold; and
a thermal spray gun for forming an atomized metal;
wherein the indexing table is rotatable in a series of discrete increments.
- [c21] 21. The apparatus of claim 20 wherein the indexing table is rotatable in increments between 0 degrees and 360 degrees.
- [c22] 22. The apparatus of claim 20 wherein the indexing table is rotatable a series of increments that when added together produce a total rotation that is greater than 360 degrees.
- [c23] 23. The apparatus of claim 20 further comprising a pro-

grammable controller for rotating the indexing table.

[c24] 24. The apparatus of claim 20 wherein the programmable controller is a robot or a computer.

[c25] 25. The apparatus of claim 20 wherein the programmable controller is a six-axis robot.

[c26] 26. The apparatus of claim 20 wherein the thermal spray gun includes an electric arc source, a nozzle for producing a high velocity gas, and at least one consumable metal wire such that the at least one consumable metal wire is melted during operation of the thermal spray gun.

[c27] 27. The apparatus of claim 20 wherein the at least one consumable metal wire is two consumable metal wires.